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In accordance with section 1, regulation 6, of the rules and regulations of the Secretary of Agriculture for carrying out the Federal highway act, approved November 9, 1921 (42 Stat. 212), and amendments thereto (except the provisions relative to forest roads), issued July 31, 1922, I, William M. Jardine, Secretary of Agriculture, do hereby prescribe and promulgate the following standards governing the form and arrangement of plans, specifications, contract forms, and estimates for all Federal-aid projects submitted after December 31, 1925, to supersede the standards issued April 28, 1917, and amendments thereto, governing Federal-aid projects under the act of July 11, 1916 (39 Stat. 355), except section 8 thereof.



In witness whereof I have hereunto set my hand this 10th day of November, 1925. Let the seal of the Department of Agriculture be hereunto affixed.

W. M. JARDINE,
Secretary of Agriculture.

STANDARDS GOVERNING PLANS, SPECIFICATIONS, CONTRACT FORMS, AND ESTIMATES FOR FEDERAL-AID HIGHWAY PROJECTS

As provided in the Rules and Regulations for Carrying Out the Federal Highway Act and Amendments thereto (Except its Provisions Relative to Forest Roads), Approved by the Secretary of Agriculture and Containing Standards of Practice for Plans and Specifications Adopted by the American Association of State Highway Officials

CONTENTS

	Page		Page
Foreword.....	1	Standard outline of specifications	
Plans	2	and contract forms.....	11
Standard plans.....	8	Standard specifications and contract	
Specifications and contract forms.....	9	forms.....	12
		Estimates.....	23

FOREWORD

In order to simplify highway administration, promote uniformity of practice in contractual relations, and facilitate statistical research, these standards are promulgated. They provide a general groundwork of standard procedure, form, and arrangement with respect to plans, specifications, and estimates for Federal-aid road design and construction control. As with simplified practice in the industries, it is the purpose to stimulate the discarding of unnecessary variants in sizes and arrangements of plans and specifications, and, also so far as expedient, in subject matter of specifications, and to establish single authorized standards about which general practice may take uniform shape.

For the purposes of country-wide administration it has been found necessary in these standards to fix lines of demarcation as between matter to appear on plans and matter to appear in specifications, to emphasize systematic and conclusive stipulations as to measurement and payment of items of work, and to regulate the form of estimates. Accepted terminology and standardized phraseology should be made use of in Federal-aid work. So far as expedient, there has been indicated in the "Standard outline of specifications" typical phraseology which has best withstood the tests of time and of the courts, and such phraseology should be consistently employed.

The use of the "Standard outline of specifications" is not intended to encroach on controversial matters nor to discourage logical variations arising from local conditions or laws. It has become obvious, however, that the bulk of existing highway specifications used

by the several States is composed of unanimously recognized and almost identical contractual procedures, clauses, types of construction, items, and groups of items. With the development by all the States of specifications based on an identical groundwork, it is entirely conceivable that controversial matters will be reduced to their lowest terms and that the large body of highway specification text matter already, as to intent, virtually common among all the States, may become essentially identical in form and letter save for fundamental regional variations.

PLANS

The plans will consist of a title-page, typical cross section of improvement, plan and profile, cross sections, and such structural plans and State structural standards as may be necessary to show properly the proposed construction.

SUBMISSION

Blue-print copies of all plans, with the exceptions hereinafter noted, are to be submitted in triplicate with each project. One of the three sets will be signed and returned when the plans are approved. One set only of cross sections is to be submitted.

Complete detail plans for all culverts and minor structures shall be furnished with each project except as hereinafter noted. In the case of bridges, general plans shall be similarly submitted and approved before bids are requested; but certain supplementary plans may be submitted after the bids are requested or contracts awarded but before work is begun involving the supplementary plans in question. General bridge plans shall show the bridge site, profile of crossing, proposed roadway, and sufficient general information upon which to base the letting. The supplementary plans implied shall be those involving shop details, erection plans, special plans of any sort, which it is impracticable to submit in advance.

For bridges requiring the approval of the Secretary of War, data required by him should, if practicable, be submitted for approval prior to its submission to the War Department. The remaining plans should be submitted as herein called for after authority has been granted by the Secretary of War.

When State standard plans which have been approved by the bureau as standard are to govern, copies need not be submitted with the projects. All such plans, when involved, shall be cited by number and date of bureau approval. Such citations or references should appropriately and clearly appear on the title page, typical cross section page, or first page of the road plans of each project. Upon request, additional copies of standard or special structural plans shall be submitted.

GENERAL REQUIREMENTS

SIZES AND FORMS

The standards of practice for road and bridge plans adopted by the American Association of State Highway Officials as of February 20, 1925, are approved for use in connection with Federal-aid projects. These standards are shown by Figures 1, 2, and 3. The plans or

drawings, except bridge plans, will be on flat sheets 22 by 36 inches outside dimensions. Bridge plans will be on flat sheets 22 inches wide from top to bottom and not less than 36 inches long outside dimen-

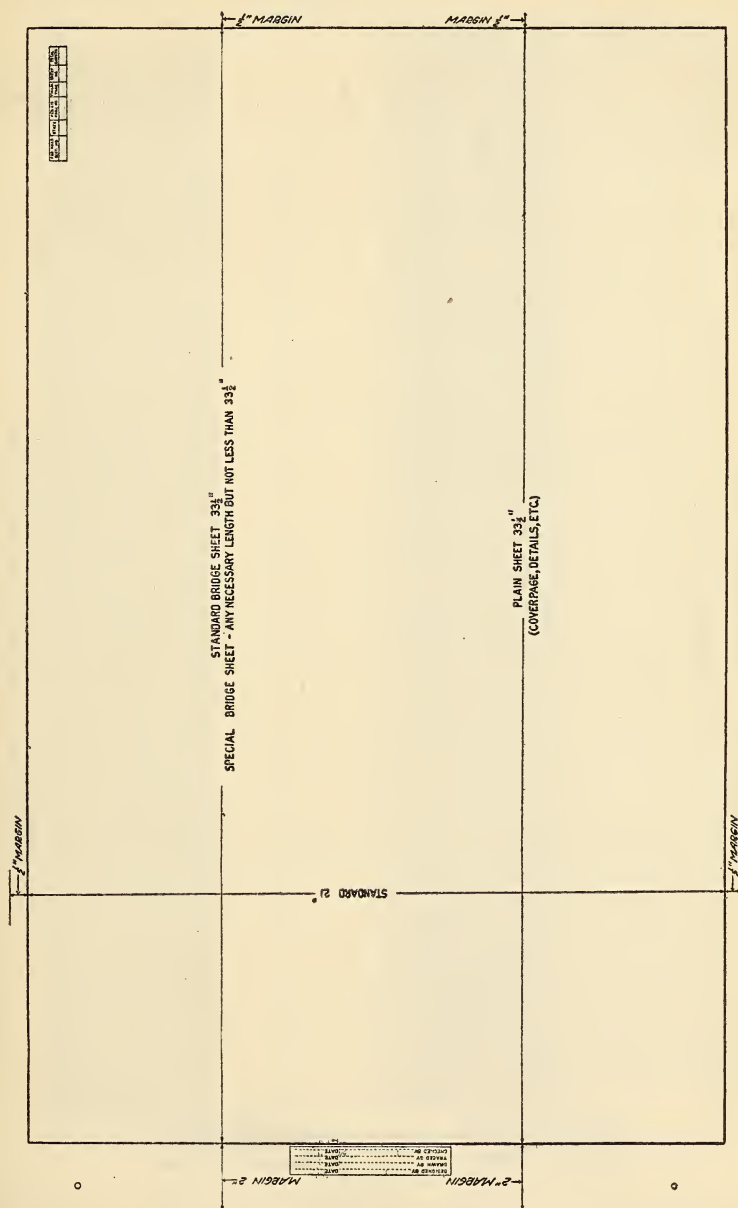


FIG. 1.—Standard bridge sheet

sions, but may be sufficiently longer to accommodate the design. Border lines are to be so placed on all plans as to provide a binding margin 2 inches wide at the left-hand end and a margin one-half

inch wide on the remaining three edges. On cross section sheets the border lines may be omitted, but sufficient space should be allowed for a 2-inch binding edge at the left hand of the sheets.

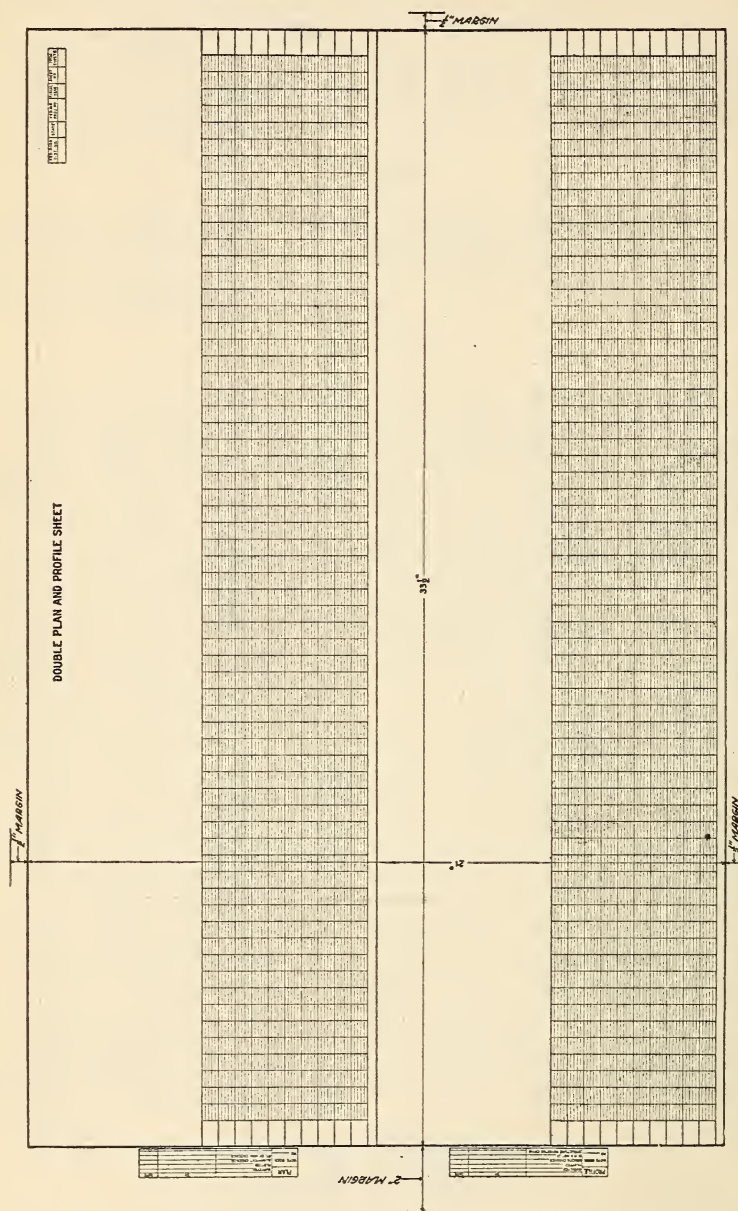


FIG. 2.—Double plan and profile sheet

FIELD SURVEYS AND LOCAL FEATURES

The plans are to be based upon suitable surveys, and all notation necessary to make the required details clear is to appear appropriately throughout the plans.

Any information which the State highway departments may deem necessary for their own uses may be incorporated in the plans, in

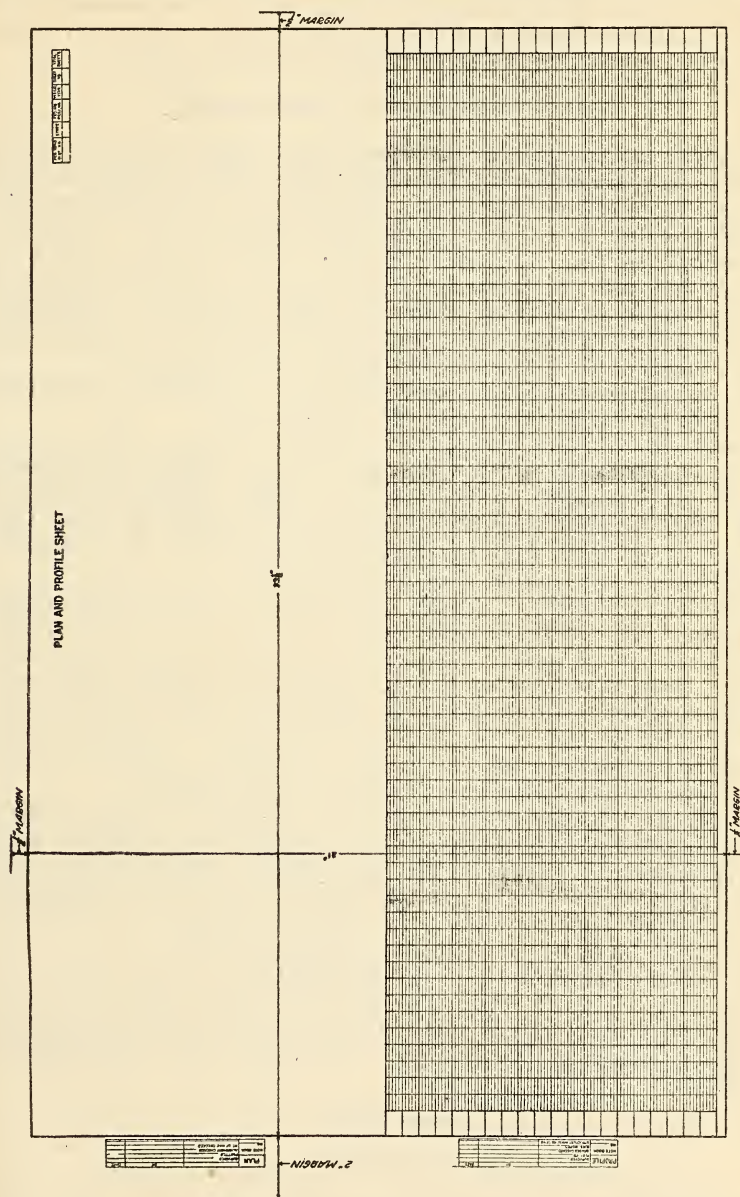


FIG. 3.—Plan and profile sheet

addition to that herein prescribed, provided it does not interfere with their legibility.

TITLE-PAGE

The title-page for the set of plans shall show conveniently arranged the title, scales, a layout map, an index of the drawings,

a key to the conventional signs used, the number of the project in the upper right-hand corner, and in the lower right-hand corner a sufficient number of blank spaces for the dates and signatures of the approving State officials and blank spaces for the dates and signatures of two approving Federal officials, with their titles.

TYPICAL CROSS SECTION OF IMPROVEMENT

A typical cross section of the improvement shall be placed on the first sheet directly following the title-page. This section, on a suitable scale, should show the various slopes for cut and fill, the width of graded section in cut and on embankment, the crown or shape of the finished surface, shoulders, gutters, etc., between slopes, the width in feet and thickness in inches of all the various courses of metaling to be used (base courses, surface courses or pavement) and the position of the profile grade line relative to the typical cross section, together with any desired additional details.

The typical cross section sheet must be a component part of the plans of every project, including bridge projects.

When more than one typical cross section is involved in a project, the proposed location where each is to be used should be indicated. Typical cross sections of all alternate types proposed should be shown with detailed thickness dimensions in inches for each type.

On this sheet there may also be shown, if desired, any special information, such as summary of quantities, etc.

In the case of bridge projects, in addition to showing the details and actual width of traversable way, the typical cross section sheet should show the proposed cross section of the approaches in detail.

Dimensional thickness or depth of courses in inches shall in all cases be distinctly shown on the typical cross section sheet accompanying each project. Discretionary or random thickness or depth will not be satisfactory save in the case of reconstructed base courses where other substantial courses are to be superimposed.

Features such as the general form of cross section (without thickness dimensions of base courses, surface courses, or pavement) standards for slopes in varying types of material, tolerances for over-break, plans and details of gutters, superelevation and widening of curves, erosion resisting and protective structures, and side-entrance features may be shown on approved standard plans.

All features pertaining or supplementary to the typical cross section sheet, but shown on approved standard plans, may be omitted, but the approved standard plans to govern should be appropriately and clearly cited on the typical cross section sheet and identified by number.

ROAD PLANS

ARRANGEMENT

The plans shall be drafted to a scale of 1 inch to 50, 100, or 200 feet, at the option of the State highway department, and the profile shall be drafted to the same horizontal scale as the plan and to a vertical scale having a ratio with the horizontal of 1 to 5 or 1 to 10. Choice of scales should be made with regard to topography and type of work and to the data required on the plans. A distorted lateral

scale may be used on the plans at the option of the States, provided it is not greater than twice the longitudinal scale.

DATA ON PLAN

The plan of the road shall show the center line of construction, bearing of tangents, right-of-way lines, stations of beginning and ending of curves, approximate radii of curvature, station points, equations of stationing, streams, and railroads on or near the right of way, poles for wire lines, and other obstructions on the right of way. Structures outside of the right of way need be shown only when affected by the proposed construction. The location of proposed new culverts and bridges with their sizes, also the location and sizes of old culverts or bridges which are to be left in place, and used, are to be shown. Any old-road surfaces or portions of pavement to be used in place in connection with the proposed construction and all unusual or special features which can be anticipated, such as guard rail, retaining walls, ditch protection, and subdrains, shall be shown. Such of these items as lend themselves readily to location by description may be tabulated or noted, but the tabulation or notation should appear on each sheet of the plan concerned. In minor changes of location requiring new or additional right of way the margins of the old roadway shall be shown by light broken lines.

The plan should be platted with the stationing from left to right. A north point should be placed on each sheet. All curve points or angles on the construction line and the 100 or 500-foot station points should be marked.

DATA ON PROFILE

The profile is to show surface line, grade line, length of vertical curves, percentage of gradient, datum line, and station ordinate lines, in all cases. When the profile is made on plain tracing cloth or paper, then surface elevations and grade elevations at station ordinates and at changes of gradient shall be shown; but when the profile is made on tracing cloth or paper having standard profile ruling for the required scales, surface elevations may be omitted and grade elevations shown only at changes of gradient. The surface line of stream beds under existing bridges, as well as that of the bridge floors, should be shown.

Where possible, balance points of excavation and fill shall be indicated on the profile, with the quantities involved.

The grade line shall represent the profile of the surface of the finished pavement or surfacing along the center line of the proposed construction, or the profile of the subgrade as prepared for surfacing along such center line. In every case a notation shall clearly indicate whether the grade line represents the surface of finished pavement or subgrade.

The surface line shall represent the profile of the surface of the ground along the center of the present traveled way where the new location of the roadway is to be essentially the same as the old location, although the centers may deviate slightly. Where relocations or realignments are made which will cause the center line of the roadway to be essentially different from the center of the present traveled way, the surface line shall represent the profile of the

ground along the center of the proposed roadway. The surface line is to be drawn as a series of straight lines.

CROSS SECTIONS

Cross sections shall be taken at such intervals as may be necessary to show accurately the character and extent of the intended work. The cross sections shall be platted to a horizontal and vertical scale of 1 inch to 10 feet or to any larger scale at the option of the State highway departments. They shall be platted from the bottom of the sheet upward, and so as not to unduly interfere with one another. Either the lower side or the right-hand end of the sheets may be used as the bottom in platting.

The cross sections shall be drafted to show the cross section of the ground surface and either (a) the proposed typical cross section or (b) a level line so located with reference to the profile grade as to give a cross-sectional area equivalent to that given by the proposed typical cross section. In both cases the side slopes, ditches, etc., shall be shown, the ground line shall be extended slightly beyond the slope intersections, and if the second case is used the adjusted flat sub-grade line shall be shown on the typical section. Each cross section shall be marked with its station location, grade-line elevation, and the yardage between sections. Any additional information may be shown.

STRUCTURAL PLANS

Detail plans for culverts (drainage structures with clear spans not exceeding 20 feet measured along the center line of the roadway) shall definitely indicate the class or classes of concrete to be used and shall be fully dimensioned. Skeleton plans with dimensions inserted in handwriting, or to be inserted, with penciled or inked alterations involving stress calculation, or with any notations in any way rendering the proposed construction confused or uncertain will not be satisfactory.

Similar requirements shall obtain with respect to detail plans for miscellaneous minor structures, retaining walls, guard rails, erosion-resisting structures and work, inlets, manholes, markers, etc. Detail plans for such of these features as are shown on approved standard plans may be omitted from the project plans, but the approved standard plans involved shall in all cases be appropriately cited and identified by number.

A complete set of plans for bridges (structures with clear spans of more than 20 feet when measured under the copings along the center line of the roadway) shall contain the following drawings and information: Plan of bridge site, details of foundation conditions, profile of crossing, cross sections, complete stresses, general design, design and construction details, shop and all minor details, and such other drawings as may be essential to make the information complete and intelligible.

STANDARD PLANS

State standard plans for design and construction of bridges, culverts, minor structures, standard detail sheets for pavements, and road cross sections (excluding thickness dimensions of bases and

pavements), standard sheets covering miscellaneous structures and construction, any suitable standard features adaptable to such use, and plans showing general assumptions and standards of design and practice may be submitted for approval and used as standard when approved by the Bureau of Public Roads. Such approval is subject to cancellation whenever the plans are found unsatisfactory.

SUBMISSION

When approval of State standard plans is desired, such plans shall be submitted for detailed review. In all cases four copies of the plans should be submitted; one copy will be signed and returned when approved. When approved standard plans are to govern any feature of a project, specific detailed plans for such features need not be submitted with the project, but on the project plans shall appear appropriate reference citing the approved plans by number; the approved standard plans thus cited shall then be in force and govern the features in question.

GENERAL REQUIREMENTS

Sizes, form and arrangement of standard plans shall conform in all respects to general requirements for plans. Standard structural plans shall conform to the requirements for structural plans. All standard plans should be clearly and succinctly titled so as to indicate unmistakably the purpose and limitations of their application and use.

On standard plans should appear notations stating that State standard specifications in force as of the date of use of the plans shall apply (when such is the case), the intent being that approved standard specifications with all amendments to date of use shall automatically apply.

SPECIFICATIONS AND CONTRACT FORMS

At the time project plans are submitted, in all cases save the special exceptions given below, there shall also be submitted three copies of the specifications and contract forms which are to govern. These specifications and contract forms shall contain the general specifications, notice to contractors, special provisions, proposal, contract and bond forms, and any necessary papers pertaining thereto. If State standard specifications, previously approved by the bureau as standard, are to govern, copies need not be submitted with each project. Definite reference must be made on the title sheet of plans and in the special provisions and contract to the particular standard specifications which are to be used, to the end that the application of the plans and special provisions to the particular specifications of which they are supplementary shall be clearly and legally established. Standard specifications must in all cases be cited by the date of bureau approval. Such citation shall appear on the plans and when the special provisions, proposal, and contract, or any one of them, are bound separately, the citation shall also appear on such separately bound pamphlets or instruments. After award of contract for any project a complete copy of the specifications to govern the project, together with any special provisions which are to obtain,

the whole acknowledged and indorsed by the contractor, shall be submitted to the bureau, when so requested.

GENERAL REQUIREMENTS

The specifications and contract for any project, with the exceptions hereinafter explained, shall contain the following divisions or parts:

- I. General requirements and covenants.
- II. Construction details.
- III. Design details.
- IV. Material details.
- V. Contract forms.

Contract forms shall consist of—

- Notice to contractors.
- Special provisions.
- Proposal, contract, and bond forms.

FORM AND ARRANGEMENT

All specifications shall be printed, typed or mimeographed on paper 8½ by 11 inches, and shall not contain hand-written corrections, interlineations, or inserts. Such alterations or additions as are desired should be taken care of by means of paragraphs and stipulations appearing in the special provisions.

Standards of practice for the arrangement of specifications, adopted by the American Association of State Highway Officials as of February 20, 1925, are embodied in the standard outline of specifications and contract forms hereinafter given, and all specifications for Federal-aid work shall be arranged in accordance with the standard outline.

PROJECT SPECIFICATIONS

The division Design Details may be omitted when design of bridges is not involved in the contract. The division Material Details may be omitted when all necessary properties and requirements for the materials to be used in each individual item of construction are fully prescribed in the material paragraph or subsection appearing in such individual item.

The division Construction Details when complete will contain sections on earthwork, base courses, surface courses and pavements, structures, and incidental construction. These sections may be subdivided into pamphlets as desired, provided the sequence and coordination is made unmistakable. In such case, pamphlets covering only sections of construction details not involved need not be submitted. In the case of bridge projects the above procedure may be followed or the Section Structures may be combined with Divisions I, III, and V to form a bridge construction and design specification. Any other logical separation into a series of pamphlets may be adopted, so long as the whole scheme is consistently worked out and is covered by a master outline.

SPECIAL PROVISIONS

The special provisions should be in formal order and arrangement. They should either be carefully mimeographed or printed, or may be on printed forms carefully filled out in handwriting or

typing. Stipulations should appear indicating the order or precedence in case of conflict between the special provisions and other project papers.

Special provisions should govern all matters peculiar to the individual project, and therefore not covered in standard or general specifications. They should be held to a minimum, however, and so far as possible should utilize all available standard or general specifications. Standard specifications should be used so far as they can be made to apply when supplemented by the special provisions.

PROPOSAL

A proposal should contain a schedule of items of identical names and pay units stipulated in the specifications, together with a list of estimated quantities. When independent pamphlets are prepared and used, the contract should contain a formal list of pamphlets involved (with pages), acknowledged and indorsed by the contractor as binding, in order to obviate later disagreements as to what stipulations are to govern.

STANDARD SPECIFICATIONS AND CONTRACT FORMS

State standard specifications may be submitted for approval and used as standard when approved by the bureau. Such approval shall hold until canceled and shall be subject to cancellation when the items and requirements, or a substantial proportion of them, are found to be no longer satisfactory and adequate. Standard specifications may be comprised of complete road and bridge specifications, bridge construction specifications, bridge construction and design specifications, or bridge design specifications. Single items will not be accepted and approved as standard except as supplemental or revised portions of previously submitted general specifications.

SUBMISSION

When approval of State standard specifications is desired, such specifications conforming with the standard outline shall be submitted for review. Six copies shall be submitted for review; one copy will be signed and returned when approved. All subsequent revisions should be similarly submitted.

Specifications may be submitted in independent and serially arranged pamphlets as desired as herein provided under specifications, provided the general outline and groundwork of the complete specification accompanies the first pamphlet submitted.

FORM AND ARRANGEMENT

General requirements and standards for size, form and arrangement shall be as prescribed under specifications.

STANDARD OUTLINE OF SPECIFICATIONS AND CONTRACT FORMS

NOTE.—General headings and subheadings appear in the outline in the order and form in which, it is proposed, they should be used in specifications; each of these subheadings should cover pertinent subject matter, treated in the form and arrangement indicated. Subject matter to be dealt with under each item and subheading is briefed, where not otherwise clear and self-evident. To promote succinctness, as well as uniformity, the selected typical phraseology appearing in this outline is suggested as standard. It is not the intent that all subjects here outlined be covered in a specification, if not involved in the work contemplated by a State, or required by law, but such headings, items, subheadings, and subject matter as are involved in a specification should appear in the order and form indicated in this outline. Such additional items, or general subjects with suitable headings, as are desired, should be inserted in their logical position in the outline. Such additional clauses or incidental paragraphs as are desired should be placed following those shown in the item or article to which they pertain.

TITLE-PAGE OR COVER FOR SPECIFICATIONS, ETC.

The name of the State should appear at the top of the title-page in bold-faced caps.

GENERAL REQUIREMENTS AND COVENANTS

DEFINITIONS AND TERMS

Definitions of State, State highway department or commission, engineer, contractor, and all words or terms used in a special sense. It is desired that all technical terms conform to standardized usage.

PROPOSAL REQUIREMENTS AND CONDITIONS

Contents of proposal forms.—Location and description of project, approximate estimate with schedule of items for which bid prices are invited, special provisions, date, time, and place of opening.

Interpretation of estimates.—Basis of comparing bids, statement regarding right of engineer to increase or decrease quantities shown in proposal. Actual quantities to be paid for at unit prices.

Examination of plans, specifications, special provisions, and site of work.

Preparation of proposal.—Requirement that proposal must be filled out completely. Specific requirements as to signatures.

Rejection of proposals containing alterations, erasures, or irregularities.

Proposal guaranty.—Form and amount required; if certified check, to whom payable.

Delivery of proposals.

Withdrawal of proposals.

Public opening of proposals.

Disqualification of bidders.—Because of submission of more than one proposal, collusion, unbalanced proposals, lack of competency.

Competency of bidders.—Criteria as desired by State.

Material guaranty.—Showing by bidder of material sources and manufacture; samples for approval may be required previous to award of contract.

Any additional clauses desired.

AWARD AND EXECUTION OF CONTRACT

Consideration of bids.—Comparison of bids based on correct summation of items at prices bid. Right to reject any and all proposals and to waive technicalities.

Award of contract.—By whom, place, to whom, and when made.

Return of proposal guarantees.—How and when returned.

Requirement of contract bond.—Reference to form furnished by State and to the amount, or to percentage of amount of contract required.

Execution of contract.—Time and place.

Approval of contract.—Reference to such formal approval as State or local laws require.

Failure to execute contract.—After certain period, cause for annulment; guarantee becomes property of State. Statement as to procedure with work.

Any additional clauses desired.

SCOPE OF WORK

Intent of plans and specifications.—Statement that the intent is to prescribe a complete work or improvement which the contractor undertakes to do, in full compliance with the plans, these specifications, the special provisions, proposals, and contract, including all earthwork, base and surface courses, structures, and incidental construction. Contractor to furnish all required materials, equipment, tools, labor and incidentals unless in certain cases otherwise provided in these specifications, the special provisions, proposal, or contract.

Special work.—Statement that proposed construction or requirements not covered by these specifications to be covered by special provisions, and performed by contractor.

Increased or decreased quantities of work.—Engineer reserves right to alter quantities of work as found necessary or desirable without waiving or invalidating any condition or provision of contract. Contractor to perform work as increased or decreased, and no allowance to be made for anticipated profits.

Extra work.—Unforeseen work made necessary by alteration of plans or of work or by other reason, involving increased or decreased unit cost to contractor, or work necessary to complete improvement for which no price is provided in contract, all to be performed in accordance with specifications and as directed.

Maintenance of detours.—Statement indicating party responsible for, and charged with, roadway upkeep along detours during construction period.

Removal and disposal of structures and obstructions.—All obstructions, structures not designated for use, obstructing fences, telephone poles, etc., to be disposed of by the contractor as directed.

Rights in and use of materials found on the work.—Upon approval, contractor may make use of any material found in earthwork operations, for any purpose for which it is suitable; when material so made use of was intended for use in embankment or otherwise, contractor to replace with equivalent quantity of material suitable for embankment.

Final clearing up.

Any additional clauses desired.

CONTROL OF THE WORK

Authority of engineer.—All work to be done under direct supervision of the engineer, who shall decide all questions as to interpretation, materials, work, progress, disputes, and mutual rights between contractors, acceptable fulfillment, and compensation.

Plans and working drawings.—Statement that plans will show in detail structures up to and including 20-foot spans, lines, grades, typical cross section of improvement, and general cross sections; plans also will show general features of bridges (over 20-foot span). Supplementary bridge plans, shop details, etc., as necessary to be furnished by contractor but not to be used prior to approval. Authorized alterations will be indorsed on approved plans or shown on supplementary sheets. Additional details relative to working drawings.

Conformity with plans and allowable deviations.—Statement that finished work in all cases must conform with approved lines, grades, typical cross section, and general cross sections, except minor deviations authorized by engineer in writing.

Coordination of specifications, plans, and special provisions.—Statement that a requirement in any one of the three is binding. In case of discrepancy, figures to govern over scaled dimensions, plans over specifications, special provisions over plans.

Cooperation by contractor.—Two sets of approved plans, specifications, and special provisions and authorized alterations supplied to contractor; one set must be kept available on work. English-speaking contractor's representative to be available to receive and execute orders. Contractor to avoid interference with other contractors.

Construction stakes.—Furnished and set up by engineer to give line and grade; contractor to furnish all additional stakes, templates, and other materials and work necessary for marking and maintaining points and lines. Finished surfaces to conform in all respects to lines, grades, and plans.

Authority and duties of inspectors.—Inspectors employed by State to inspect all work and material and report to engineer; and to note and suspend, if necessary, unsatisfactory work and reject work containing unsatisfactory

14 *Miscellaneous Circular 62, U. S. Dept. of Agriculture*

materials, all pending final decision by engineer. Not authorized to alter specifications, nor accept any portion of work, nor act as foreman for contractor, nor interfere with management of work, nor to bind engineer in any way.

Inspection.—Contractors to furnish engineer and inspector with every facility for complete inspection of work and of the preparation and manufacture of the materials, also to uncover questioned work if ordered; detailed procedure in such cases.

Removal of defective and unauthorized work.—Defective work to be remedied or removed and replaced forthwith as directed, at contractor's expense. Unauthorized work to be removed if so ordered. Engineer may replace and charge against contractor.

Final inspection.—To be made within certain period subsequent to final cleaning up following completion of project.

Any additional clauses desired.

CONTROL OF MATERIAL

Source of supply and quality.—Statement that only approved materials conforming to requirements shall be used. Approved source of supply to stand approved only so long as the material conforms to requirements.

Samples and tests.—Prescribed samples to be submitted by contractor or producer for testing. Tests to be made in accordance with United States Department of Agriculture Bulletin 1216 (or other recognized methods if desired). Contractor to furnish facilities for verification of his scales and measures.

Storage.—Preservation and fitness to be assured.

Defective materials.—Materials not conforming to requirements shall be rejected and removed from work, and replaced in an acceptable manner by contractor at his expense. Engineer may remove and charge against contractor.

Any additional clauses desired.

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Laws to be observed.—Federal, State, and local; to save the State harmless against all claims for violations.

Permits and licenses.—Contractor to procure.

Patented devices, materials, and processes.

Restoration of surfaces opened by permit.—Contractor not to allow openings except on authorized permit. Repair work involved to be performed by contractor at expense of party making opening.

Federal participation.—Contractor placed on notice that the work is to be subject to inspection by the Federal Government, which is not, however, a party to the contract.

Sanitary provisions.—Contractor to comply with board of health requirements.

Public convenience and safety.—Comprehensive regulations and instructions relative to handling the work to assure uninterrupted convenience and safety to traffic and the public along or near the work. If desired, detail here maintenance of half the roadway for traffic during construction. No road to be closed to public except by express permission of the engineer.

Barricades and warning signs.—Contractor to provide; to be illuminated at night.

Use of explosives.

Protection and restoration of property.—Contractor not to trespass upon, damage, or neglect the rights of public or private property; to take precautions to protect same, also underground structures, monuments, and trees; to restore at own expense where, directly or indirectly, is responsible for injury occurring; or, upon notice engineer may cause such restoration and charge against moneys due or to become due contractor.

Responsibility for damage claims.—Contractor to assume when brought in suits for any damage, injury, or infringement resulting from his work or neglect; engineer may retain, sufficient to cover, moneys due or to become due contractor.

Opening of section of highway to traffic.—At option of engineer; but such opening not an acceptance, and maintenance to be at contractor's expense unless otherwise specifically provided.

Contractor's responsibility for work.—Does not cease until final acceptance by engineer in writing. Responsibility covers all injury to work from elements

and traffic unless otherwise provided. Contractor to repair same, also to care for materials and unfinished work during suspension.

Personal liability of public officials.

No waiver of legal rights.

Any additional clauses desired.

PROSECUTION AND PROGRESS

Subletting or assignment of contract.

Prosecution of work.—Notice of beginning. Place of starting determined by engineer. Prosecuted at points as ordered. When resuming work subsequent to suspension, contractor to give due notice to engineer to afford opportunity to reestablish inspection.

Limitations of operation.—Contractor not to open up work to the prejudice of work already started or to inconvenience traffic more than is necessary as determined by the engineer.

Character of workmen and equipment.

Temporary suspension of work.—Wholly or in part, at order of engineer, because of unfavorable weather, or other essential conditions; or because of failure on the part of the contractor to properly prosecute the work in accordance with the contract, to carry out orders, to remove defective material or work; but the contractor shall not suspend the work without authority.

Determination and extension of contract time for completion.

Failure to complete work on time.

Annulment of contract.—Detailed causes, procedure, and retent.

Termination of contractor's responsibility.—Contract to be considered complete when all work has been completed and accepted by engineer and final estimate paid; contractor to be then released from further obligation except as set forth in his bond.

Any additional clauses desired.

MEASUREMENT AND PAYMENT

Measurement of quantities.—All work acceptably completed under the contract to be measured by United States standard measures and quantities of work performed to be computed based on such measurements. Linear base course, surface course, or pavement measurements to be along actual surfaces not horizontally. Structures to be measured according to neat line shown on plan or ordered.

Scope of payment.—Compensation provided, at bid prices, to be accepted as full payment for materials, labor, tools, and equipment necessary to perform and complete the work, also loss, damage, unforeseen difficulties, all risks and patent infringements. Before payment contractor to satisfy engineer as to liquidation of bills.

Increased or decreased quantities.—Increased or decreased quantities of work for which there are contract unit prices to be paid at such prices for the quantities actually done with no allowance for anticipated profits. Such restrictive provisions as desired.

Extra and force account work.—Extra work to be paid either under a supplemental agreement or by force account as agreed before starting such work. Supplemental agreement to be signed by both parties. Force account to be done only upon written order. Detailed procedure relative to force account payment.

Omitted items.—Provision that engineer may order omitted from contract, items found unnecessary to the improvement without vitiating contract with such restrictive provisions as desired.

Partial payments.

Acceptance and final payment.

Any additional clauses desired.

CONSTRUCTION DETAILS

EARTHWORK

Description.—Earthwork to consist of all clearing and grubbing, roadway and drainage excavation, excavation for structures, embankment, borrow, overhaul, subgrade, shoulder, and sub-base construction, all to be done by contractor and paid for in accordance with these specifications.

CLEARING AND GRUBBING

Description.—Specific requirements.

Measurement and payment.—As desired, or may be referred to other items.

ROADWAY AND DRAINAGE EXCAVATION

Description.—"This work shall consist of," (etc., giving specific list of all types and features of work desired to be included) "all in conformity with the lines, grades and cross sections shown on plans." *Classification.*

Construction methods.

Method of measurement.—In original position by average end area method; measurement of overbreak as desired.

Basis of payment.

EXCAVATION FOR STRUCTURES

Description.—Statement of work included (not to overlap roadway and drainage excavation).

Construction methods.—Depth, back fill, layers, compaction, cofferdams, foundation conditions, etc.

Method of measurement.—Allowance outside of neat structure lines.

Basis of payment.

EMBANKMENT

Construction methods.—Of suitable material; depth of layers, compaction; hillside embankment; responsibility.

Compensation.—Not to be paid for directly but to be considered part of work included in prices bid for excavation and borrow.

DISPOSAL OF SURPLUS MATERIAL

Statement of requirements.—Not to be compensated for directly, but to be considered part of work included in prices bid for excavation and borrow.

BORROW

Description.—To consist of excavation, and disposal as directed, of satisfactory material obtained from borrow pits when sufficient acceptable material is not available from excavation to complete embankments.

Construction methods.—No work prior to staking out; pits to be trimmed to permit measurement; to drain where practicable.

Method of measurement and basis of payment.—In original position by average end areas or equivalent method.

OVERHAUL

Method of determination and basis of payment.

SUBGRADE

Description.—After earthwork substantially completed and all drains laid, subgrade to be brought to lines, grade, and typical cross section shown on plans.

Construction methods.—Soft and unstable material, also rock to be removed; to be refilled with suitable material from excavation and borrow. Clauses on rolling as desired; superficial scarifying of old stone or gravel roadways where reconstructed base course not ordered; Highway and railway intersections.

Protection of subgrade.—For surface courses; for pavements; no storage or stock piling of material; no surfacing material to be placed or pavement laid on frozen or muddy subgrade; nor on any subgrade prior to checking and approval.

Compensation.—As desired.

SHOULDERS

Description.—After earthwork substantially completed and all drains laid, shoulders to be constructed of approved material, to elevation, width, and shape shown on plans, and dressed as directed after surface course or pavement is completed.

Materials and construction methods.

Method of measurement and compensation.—As desired.

SUB-BASE

Description.—Item to consist of special approved material, placed and compacted in excavations made by removal of soft, unstable or other unsuitable subgrade materials; to be constructed where specifically ordered.

Materials.—Field or quarry stone, etc.; filler—slag, gravel, etc.

Construction methods.

Method of measurement and basis of payment.—As desired (usually by cubic yard).

FINISHING EARTH GRADED ROADS

Description.—Where road to be finished as an earth graded road without surfacing other than earth, after all other earthwork and all structures completed, roadway to be finished for travel, to lines, grades, and typical cross section shown on plans.

Construction methods.

Method of measurement and basis of payment.

FINE GRADING SUBGRADE AND SHOULDERS

Description.—This work to consist of preparing a previously graded road for immediate placement of surface courses or pavements.

Construction methods.

Method of measurement and basis of payment.—As desired or may be stipulated as included under some other suitable item.

BASE COURSES

Conform to the following outline for each kind of course desired:

SUBGRADE TREATMENT

NOTE.—This item does not have reference to or include the ordinary usual preparation—grading, rolling, etc.—of the subgrade; such work should be detailed in the item subgrade of the earthwork section.

Description.—Item to consist of granular or other stabilizing courses constructed on the subgrade in accordance with these specifications and conforming in all respects with the line, grades, and typical cross section shown on plans.

Materials.

Construction methods.

Method of measurement and basis of payment.

(INSERT NAME) BASE COURSE

Description.—Item to consist of foundation course of (name material), constructed on the subgrade or other completed base course in accordance with these specifications, conforming in all respects with the line, grade, thickness, and typical cross section shown on plans.

Materials.—Stone, sand, screenings, binder, etc.

Construction methods.—Placing, rolling, etc.,

Method of measurement.

Basis of payment.

SURFACE COURSES OR PAVEMENT

BITUMINOUS SURFACE TREATMENT

Description.—Indicate number of treatments and gallons to each treatment if paid by square yard; or prescribe "item to consist of consecutive treatments of amount and type of material noted on typical cross section on plans."

Materials.

Construction methods.

Method of measurement and basis of payment.—Preferably by square yard.

(INSERT NAME) SURFACE COURSE (OR PAVEMENT)

(Repeat the following outline for each kind of surfacing or pavement. Arrange in order from lower types to higher. Each item should prescribe a templet and straight-edge test of finished surface.)

Description.

Materials.

Construction methods.

Method of measurement.—Details of measurement.

Basis of payment.—"The accepted quantities of this item thus measured shall be paid for at the contract unit prices bid per square yard for (insert exact name), which price, except as otherwise expressly provided, shall be full compensation for furnishing, hauling, and placing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item."

STRUCTURES

CONCRETE BRIDGES

Description.—Concrete bridges to be built as indicated on plans, conforming to line, grade, and dimensions shown, and in accordance with the specifications for piling, concrete, reinforcing steel and other pay items which constitute the complete structure.

Materials.—Statement that materials shall be those prescribed for the several items which constitute the structure with supplementary requirements pertaining to bridges as desired.

Construction methods.—Prescribe foundation construction and approval, falsework, sequence and method of casting and details peculiar to bridge construction. Manipulation and mixing of materials, concrete finish, protection, etc., should be prescribed under concrete except such requirements peculiar to bridges as are desired here.

Design.—May be detailed as desired here or reference made to independent bridge design section.

Method of measurement and basis of payment.—Statement that the bridge will be paid for by the actual quantities of the various items incorporated—piling, concrete of the various classes, reinforcing steel and wearing floor surface complete in place at the unit prices bid for the several pay items enumerated which prices, except as otherwise expressly provided, shall be full compensation for all work, material, labor, and incidental work necessary to complete the bridge ready for use.

STEEL BRIDGES

Description.

Materials.

Construction methods.

Design.—May be detailed as desired here, or reference made to an independent bridge design section.

Method of measurement and basis of payment.—Statement that the bridge will be paid for by the actual quantities of the various items incorporated—piling, concrete, reinforcing steel, structural steel, and wearing floors as desired, all complete in place, at the unit prices bid for the several pay items enumerated, which prices, except as otherwise expressly provided, shall be full compensation for all work, materials, labor and incidental work necessary to complete the bridge ready for use.

TIMBER BRIDGES

Description.

Materials.

Construction methods.

Design.—May be detailed as desired here or reference made to an independent bridge design section.

Method of measurement and basis of payment.

CULVERTS AND RETAINING WALLS

Description.—All concrete, masonry, and pipe culverts, end walls, retaining walls to be built as indicated on plans conforming to line, grade, and dimen-

sions shown and in accordance with the specifications for concrete reinforcing steel, masonry, culvert pipe of the several varieties, and other pay items which constitute the complete structure.

Materials.—Statement that materials shall be those prescribed for the several items which constitute the structure.

Construction methods.—Foundation conditions and the construction and approval involved. Pipe culverts to be constructed of the kind of pipe indicated, suitably connected and laid. General requirements for mortar joints.

Method of measurement.—Quantities of various items for payment to be actual amounts completed and accepted. Concrete and masonry to be computed from neat dimensions shown on plans or ordered in writing, pipe to be measured in place.

Basis of payment.—Culverts, including pipe culverts and retaining walls, to be paid for at contract unit prices bid for the several pay items which constitute the completed structure, which prices, except as otherwise expressly provided, shall be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the structure ready for use.

CONCRETE

Description.—Classification and classified uses, proportions.

Materials.—Specify composition of materials for each class. Strength and quality requirements.

Construction methods.

Method of measurement and basis of payment.

REINFORCING STEEL

Description.

Materials.

Construction methods.—Bending and placing.

Method of measurement and basis of payment.

STRUCTURAL STEEL

Description.

Materials.

Construction methods.

Method of measurement and basis of payment.

(INSERT NAME) MASONRY

(Repeat for each type)

Description.

Materials.

Construction methods.

Method of measurement and basis of payment.

CONCRETE PIPE

(Conform to the following outline for each kind of pipe desired.)

Description.—This item shall consist of furnishing and placing ——— pipe conforming to these specifications. The pipe shall be furnished of the sizes and dimensions and shall be installed at the places designated by the engineer, in accordance with these specifications and in conformity with lines and grades shown on the plans.

Materials.

Manufacture.

Method of measurement and basis of payment.

CAST-IRON PIPE

CORRUGATED GALVANIZED METAL PIPE

VITRIFIED PIPE

INCIDENTAL CONSTRUCTION

Description, material, construction methods, method of measurement, and basis of payment to be included under each of the following items:

PILING

RIPRAP

CRIBBING

UNDERDRAINS

GUTTERS

CURBING

GUARD RAIL

Additional items as desired.

DESIGN DETAILS

If desired, design and design details of bridges may be grouped below, and mentioned in Construction Details division by reference only. Such cross-reference must be expressly made.

GENERAL DESIGN

Loads, stresses, substructures, and retaining wall assumptions, etc.

CONCRETE DESIGN

STRUCTURAL-STEEL DESIGN

TIMBER-STRUCTURE DESIGN

MATERIAL DETAILS

NOTE.—If it be desired to group all materials in an independent division, properties, tests, and requirements for all materials should be detailed here, In such case the materials must be classified and defined as shown below and appropriate cross reference expressly made to them under the subcaption "Materials" appearing in each item of construction details.

Cementing materials.—Portland cement, lime, etc.

Water.

Fine aggregate.—Filler dust, sand, grit, etc., for all purposes, including all nonbituminous fillers.

Coarse Aggregate.—Stone, gravel, slag, etc., for all purposes.

Telford and quarry stone, etc.

Masonry stone, etc.

Paving brick and blocks.

Bituminous materials.

Culvert pipes, draintiles, etc.—Concrete, cast iron, corrugated metal, vitrified clay, etc.

Metal reinforcement.—Bars, mesh, expanded metal, etc.

Structural steel.—Structural shapes, fabricated steel, etc.

Miscellaneous iron and steel.—Castings, special wrought work, etc.

Treated timbers.

Untreated timbers.

Paints, oils, etc.

Monuments.

Miscellaneous materials.—Fencing wire, cables, pipe rail, etc.

CONTRACT FORMS

NOTE.—Documents which pertain to the individual project and which from their nature require filling out, completion or execution should be arranged in the following order. If desired, they may be bound in a separate pamphlet.

NOTICE TO CONTRACTORS

Time and place of receiving and opening proposals.

Brief description of proposed work.

Place where plans and specifications may be examined or secured, and officials from whom information may be obtained.

Rights reserved to reject any or all proposals.

Any additional information desired, such as competency of bidders.

NOTE.—The above information should be shown in the advertisement for bids, and on the notice to contractors, which may be sent out to prospective bidders.

SPECIAL PROVISIONS

The blank form for special provisions should be made up as follows:

These special provisions take precedence over all other specifications for the construction of-----

(Give the identification of proposed work, such as road name, job number, etc.)

They supplement Standard Specification-----

(Give name and date of bureau approval)

NOTE.—For any project the blank form shown above should be filled in and all the desired special provisions should follow. There should appear all such supplemental specifications and exceptions as pertain only to the particular project and contract proposed and are not covered satisfactorily in the general specification divisions and are not standard or common to all work for which the general specifications may have been prepared, such as:

Materials, etc., furnished by the State. All materials, equipment, or other facilities for prosecuting the work, furnished by the State to the contractor, should be here listed, with conditions governing delivery, use and return.

Statement relative to disposal of specific materials or structures found on the work and not to be used in the construction thereof.

Special stipulations and requirements intended to apply to the one project only and to supersede corresponding stipulations and requirements as prescribed in the general specifications.

Specifications for special structures, such as lift bridges, etc.

PROPOSAL

Spaces for name and address of bidder.

Detailed description of location of roadway or structure, length, and width of surfacing or pavement, or length and type of structure, referring to the plans, drawings, specifications, special provisions, etc., by their titles and markings for identification. If the proposal bond form is used, it should be attached to or furnished with the proposal form.

Address (as, "To the State Highway Department").

Declaration of the bidder that the only persons or parties interested in the proposal as principals are those named therein; that the proposal is made without collusion with any other person, firm, or corporation; that he has carefully examined the specifications, including special provisions, if any, and that he has made a personal examination of the site of the work; that he is to furnish all the necessary machinery, tools, apparatus, and other means of construction, and do all the work and furnish all the materials specified in the manner and time prescribed; that he understands that the quantities are approximate only and subject to increase or decrease, and the declaration of his willingness to perform increased or decreased quantities of work in accordance with the specifications at the unit prices bid in the following proposal schedule.

When the specifications are not bound complete in one volume an itemized list of specification pamphlets, which by virtue of the intended construction are involved in the project, shall be listed in the spaces provided at this point. Such list should be introduced with a formal certification or acknowledgment.

22 *Miscellaneous Circular 62, U. S. Dept. of Agriculture*

ment by the bidder of receipt of "the pamphlets with pages as herein below listed" and acknowledgment of the same as a binding part of the contract.

Itemized proposal showing the approximate quantities with spaces for unit prices bid, as:

PROPOSAL SCHEDULE

Time for completing project ----- working days.

Approximate quantities	Items with unit bid price written in words in the blank spaces	Unit bid price	Amount bid
	Cubic yards excavation at ----- ----- per cubic yard		
	Cubic yards sub-base at ----- ----- per cubic yard		
	Square yards subgrade treatment at ----- ----- per square yard		
	Square yards concrete pavement at ----- ----- per square yard		
	Cubic yards concrete at ----- ----- per cubic yard		
	Linear feet precast concrete piling at ----- ----- per linear foot		
	Total -----		

NOTE.—Spaces should be left for filling in the unit prices both in words and figures, as indicated. The items of work should be numbered in the order and designated with the same pay-item names and based on the same units of measure provided in the basis of payment paragraph appertaining to each item appearing in the specifications. The units of measure should be as follows:

The cubic yard for all volumes except the gallon for bituminous materials when not weighed and the bag for cement.

The square yard for all surface measurements except the square foot for wire mesh or expanded metal. Acre may be used for clearing and grubbing.

The foot or mile for linear measurements.

The ton of 2,000 pounds for weights except the pound for steel and castings.

A unit price each for any item desired.

Proposal to perform extra work, or force account.

Proposal to execute contract agreement and to begin work as prescribed and to complete work as bid in schedule (or as stated in proposal).

Proposal stating the amount of contract bond.

Proposal for guaranty of work until final completion and acceptance.

Statement of inclosure of proposal guaranty, naming form, amount, and conditions of forfeiture.

Spaces for signatures, titles, and individual addresses.

PROPOSAL BOND

In case a proposal bond is used in lieu of a certified check, the form therefor should be attached to or furnished with the proposal form.

CONTRACT

The form of contract should be as short as consistent with legal requirements.

The notice to contractors, specifications, special provisions, proposal, and plans should be referred to and made a part of this agreement, and such reference should identify the specifications, plans, drawings, etc., by their specific markings. When standard specifications approved by the Bureau of Public Roads are to govern, identification must be made by date of formal approval.

The Federal Government is not to appear as party to this agreement.

CONTRACT BOND**ESTIMATES**

The estimate for each project shall show the estimated quantity and estimated cost of each pay item of construction in detail, and separately the 10 per cent fund. The estimate shall be made up of such pay items of the general specifications which are to govern as are involved in the project, arranged in the order in which they occur in such general specifications. For the purposes of bidding and payment, the name and unit of measure of each item appearing in the estimate shall be identical with the name and unit prescribed in the Basis of Payment paragraph of the pertinent item of the general specifications which are to govern. When special provisions for the project involve additional pay items, such items shall also appear in the estimate by the pertinent names and units of measure stipulated in such special provisions.

When in any estimate made up as required above¹ for the purpose of bidding and payment, any base or surface course or pavement item of the general specifications is involved but does not appear as a single unit complete in itself with all significant pay elements necessary to the item covered by the one unit price, such item shall be further developed in the estimate, in an appropriate postscript, as a composite item. Such postscript shall be arranged to show the consolidated unit price or cost of the complete item calculated from the prices of the several subsidiary pay elements involved and adjusted to the pertinent standardized unit of measure as hereinafter defined. Similarly any item, the price of which is not based on a standardized unit, shall be shown in the postscript along with the equivalent unit price adjusted to the pertinent standardized unit of measure.

For the purpose of standardization, in all cases the equivalent or consolidated unit price shall be based on the square yard or cubic yard, which shall be considered the standardized units of measurement, except the pound will be used for separately paid steel and the appropriate linear or other units for miscellaneous features.

When unit prices obtain upon materials separately from the work of construction of an item, or where any subsidiary component of the item is to be paid for independently or where materials are to be furnished by the local

¹ Under certain conditions it is found necessary to require additional information in the estimate. It is the purpose of the requirements to make it possible to read from the estimate the unit price or cost of a cubic or square yard of the whole item complete in place in such cases as when the tons of asphalt and square yards of coarse aggregate bituminous concrete pavement are the bid items shown in the estimate to make a quantity of pavement; or as when the tons of asphalt are furnished by the State and the square yards of pavement excluding the bitumen are bid upon; or as when square yards of sand-clay surface course involve a unit price per square yard for the work, but the material hauled in to make the item, will also be paid for and at a price per cubic yard; or as when a bituminous surface treatment instead of being paid for by the square yard complete in place is paid for as gallons of asphaltic cement and cubic yards or tons of mineral aggregate cover material; or as when a gross quantity of broken stone is bid upon by the ton or cubic yard loose, some of which broken stone is to be used in sub-base, some in a broken stone base course with a supplementary price for laying, and some in a bituminous macadam wearing course (which will also contain a bitumen paid for perhaps by the gallon); or as when concrete pavement is bid upon by the square yard, but the cement is lumped together with the cement to be used in culvert construction and bought by the State under a season contract. From the examples given above it is readily seen that additional information is necessary in the estimate to show the unit cost of the items complete in place. The quantity of each paid material going into each item and the total unit cost of each item per cubic yard or per square yard complete in place is required to show either in the body of the estimate or in the postscript.

government or by another contractor, the quantities of all such elements applicable to a complete unit of the composite item shall show in the estimate or in the postscript. When a material is to be used in both base and surface courses or in any two or more items, the quantities applicable to each shall be segregated. In general all subsidiary or supplementary pay features of an item shall be grouped pro rata with the titular specification item to which they appertain except as provided below.

When State or locally furnished materials are involved, all such materials shall appear in a separate group, but in such group the materials shall be divided and listed separately so that quantities applicable to each specification item shall appear. In all cases means shall be taken to show clearly a consolidated unit price or cost as hereinbefore required.

FORM AND SIZES

All estimates shall be printed, typed, or mimeographed on white paper 8 by 10½ inches, and shall be clear and easily legible. The estimated quantity of each item shall appear in the column at the left of the page, followed by the corresponding unit of measure, the designated name and the unit price, with the products totaled at the right.

SUBMISSION

In all cases, five copies of the estimate shall be submitted with the plans and specifications for each project. All subsequent revised estimates when submitted shall be of the same form and arrangement, and all changes and alterations in the extensions resulting from the revisions, shall be carried out in full.

TABLE OF CONTENTS

In the table of contents should appear in order all the major subjects and items involved in the specifications and contract. When the scheme of printing involving division of the subject matter into a series of independent pamphlets is adopted the table of contents should enumerate all pamphlets in order and by formal title and make clear the subjects and items included in each pamphlet.

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